

TORNADO-PRESSURE JUMP LINE SITUATION OF MARCH 18, 1954¹

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INTRODUCTION

During the late morning and early afternoon of March 18, 1954, an unusually large number of tornadoes occurred in eastern Kansas. These tornadoes were all situated within the observational network of the Severe Local Storms Research Unit, and consequently the pressure pattern associated with these storms could be analyzed in great detail by means of the high-speed microbarographs of the network. These microbarographs are spaced about 30 miles apart, on the average, as can be seen in figure 1.

The purpose of this note is to present a short resumé of a situation that is of particular interest because of the phenomenal agreement between the large number of tornadoes and the pressure jump line that occurred at that time. A more exhaustive case study will be prepared at a later date.

PRESSURE JUMP LINE ANALYSIS

In the course of the routine operations of the Severe Local Storms Research Unit on March 19, 1954, pressure jump reports were gleaned from the weather sequences and were plotted on a chart as in figure 2. On the basis of these 8 pressure jump reports, a preliminary analysis was made of a pressure jump line with isochrones as indicated. Lacking pressure jump reports in Kansas (the network microbarograms are not received until about a month later), but having on hand reports of some of the tornadoes, the pressure jump line was extrapolated backward in time into eastern Kansas. This was done on the basis of the findings in Weather Bureau *Research Report* No. 37 which indicate that a high percentage of severe storms occurred in connection with pressure jump lines.

Later, when the network microbarograms were received, they were analyzed carefully to determine if a pressure jump line existed in the network area on that day. The results of this analysis are presented in figure 1. After the basic data were plotted, isochrones were drawn. It may now be seen that the positions of the extrapolated isochrones of figure 2 agree very well with the actual locations on figure 1.

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TORNADOES

On the basis of reports from the Climatological Services Division and notes received from the cooperative observers in the network, the tornadoes were plotted on figure 1 without regard to their location with respect to the isochrones. Of the 15 reported tornadoes, only three did not have a specific location and time of occurrence listed.

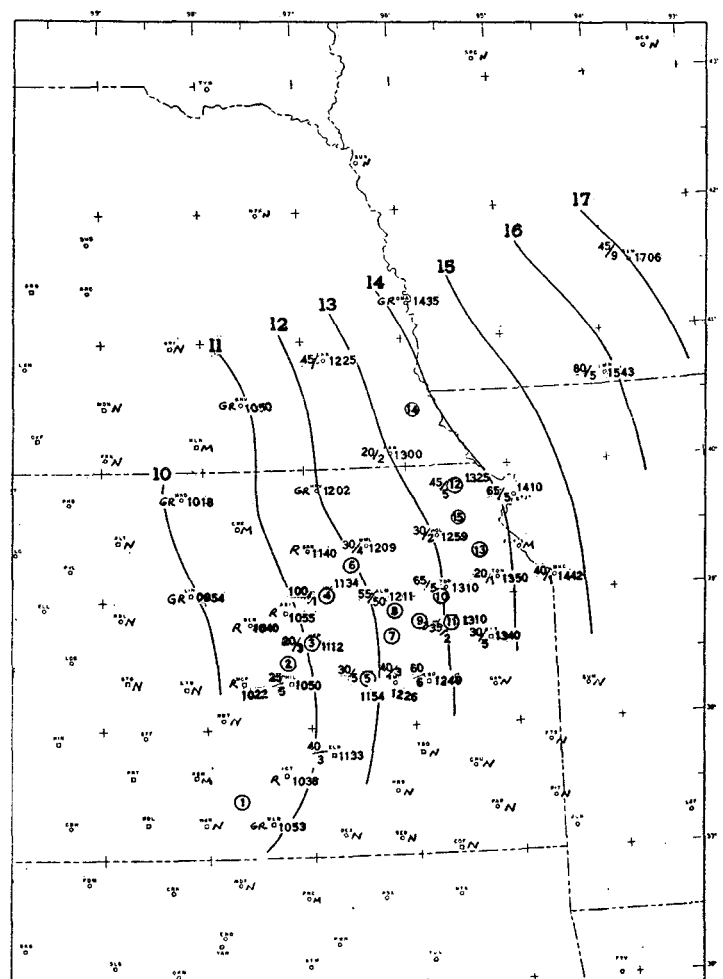


FIGURE 1.—Isochrones (cst) of pressure jump line of March 18, 1954, with tornado locations indicated by encircled numbers. Ratio at left of station circle is pressure change (.001 in. Hg) over duration of pressure change (minutes). Time of onset of pressure jump (cst) is plotted at right. GR represents gradual rise; R, rise; and N, no significant pressure change.

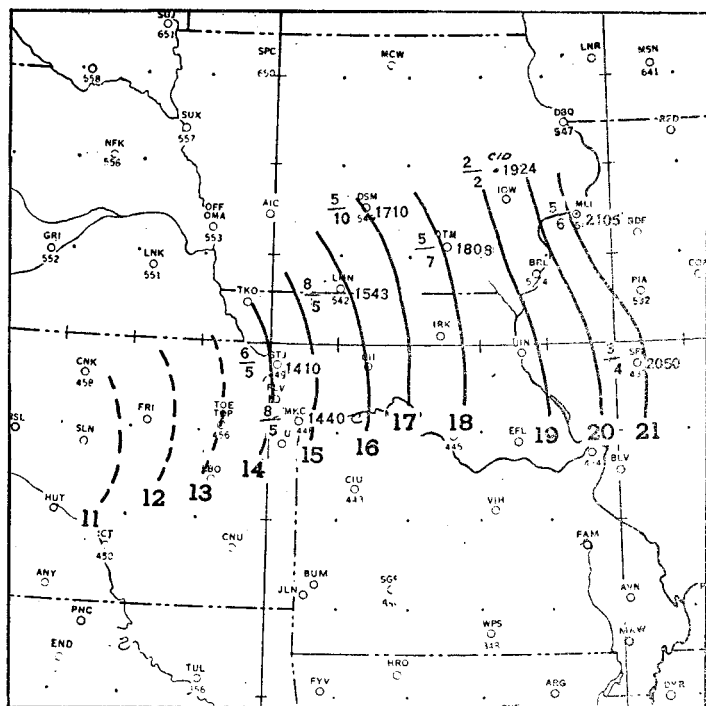


FIGURE 2.—Isochrones (cst) of pressure jump line of March 18, 1954, as determined from weather sequence reports. Ratio to left of station circle is pressure change (.01 in. Hg) over duration of pressure change (minutes). Time of onset of pressure jump is plotted at right in cst. Dashed isochrones are extrapolated.

Number 14, near Talmage, was reported as having occurred in the afternoon, and number 6, at Manhattan, at about 1220 cst with some question as to the exactness of the reported time. The report at Horton did not indicate the time.

In order to illustrate the phenomenal agreement in time and space between the tornadoes and isochrones, figure 3

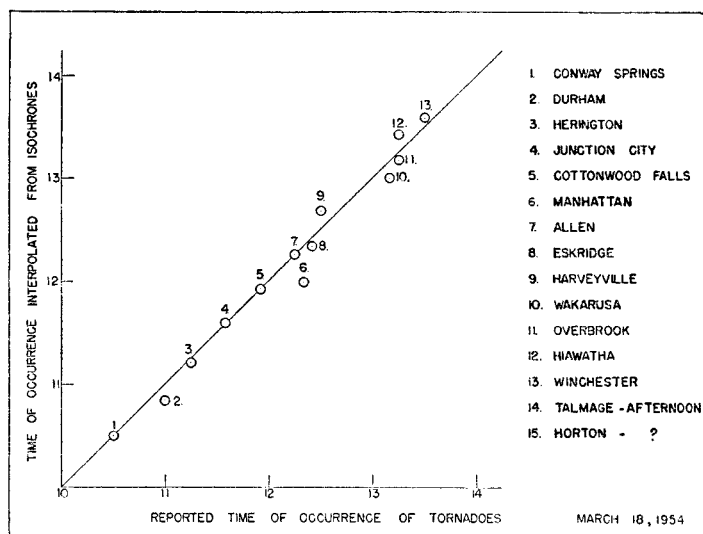


FIGURE 3.—Relationship between reported and interpolated time (cst) of occurrence of tornadoes in Kansas on March 18, 1954.

was prepared. On this diagram, the actual reported times of occurrence of the tornadoes were plotted against the times as interpolated from the isochrone field. Since the same time scale is used for both, the line that represents perfect agreement is a straight line of 45° slope. Note the remarkable fit. The tornado farthest from the line is number 6, and this is one of those whose occurrence time is uncertain.

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